

## Claims

- [c1] 1. An apparatus for scrubbing acid gas from a gas stream comprising:  
(a) a closed reaction vessel for containing a treatment fluid comprising aqueous and gaseous ammonia, said vessel having at least one reverse weir dividing the vessel into at least two chambers and having a gas inlet in one chamber and a gas outlet in another chamber; and  
(b) a source of solid iron within the vessel wherein said iron source may be in contact with either of or both the aqueous and gas phases of the treatment fluid.
- [c2] 2. The apparatus of claim 1 wherein the vessel comprises low carbon steel and wherein the source of solid iron comprises an inner surface of the vessel.
- [c3] 3. The apparatus of claim 1 wherein the vessel is an horizontally elongate cylinder and the reverse weir is transverse and substantially vertical.
- [c4] 4. The apparatus of claim 1 further comprising a tower baffle system associated with the gas outlet wherein the tower baffle system comprises an elongate outlet tower and a plurality of baffles which each partially extends across the outlet tower, diverting the gas stream along a circuitous path within the outlet tower.
- [c5] 5. The apparatus of claim 4 wherein the tower baffle system comprises uncoated low carbon steel.
- [c6] 6. The apparatus of claim 4 further comprising baffle flexing means.
- [c7] 7. The apparatus of claim 6 wherein the baffle flexing means comprises a float and a push rod connected to the float and to at least one baffle such that vertical movement of the float causes the at least one baffle to move or flex.
- [c8] 8. The apparatus of claim 1 further comprising a liquid re-circulation system comprising a pump, means for powering the pump and a sprinkler bar

wherein the pump may draw liquid from the bottom of the vessel and distribute the liquid through the sprinkler bar which is disposed at or near the top of the vessel.

9.The apparatus of claim 8 wherein the sprinkler bar sprays the liquid onto the inner surface of the vessel and/or through the gas phase.

[c9] 10.The apparatus of claim 1 wherein the vessel further comprises a first weir defining an inlet chamber for containing some liquid treatment fluid, a downcomer for introducing the gas stream into the liquid treatment fluid in the inlet chamber, and at least two reverse weirs separating the remainder of the vessel into three chambers downstream from the inlet chamber.

[c10] 11.The apparatus of claim 1 further comprising a condenser connected upstream of the gas inlet for removing condensable hydrocarbon vapours from the gas stream before the gas stream enters the vessel.

12.A method for removing an acid gas from a gas stream comprising the steps of:

- (a)providing a closed reaction vessel having a gas inlet and a gas outlet;
- (b)partially filling the vessel with a solution of ammonia such that the vessel contains a liquid phase of dissolved ammonia and a gas phase of ammonia;
- (c)providing a source of solid iron in contact with either or both of the gas and liquid phases;
- (d)introducing the gas stream into the gas inlet and contacting the gas stream with the gas phase and liquid phase; and
- (e)recovering the purified gas stream from the gas outlet.

[c11] 13.The method of claim 11 wherein the acid gas comprises hydrogen sulphide or carbon dioxide or both hydrogen sulphide and carbon dioxide.

14.The method of claim 12 wherein the vessel is divided into at least two lateral chambers separated by a weir having an opening allowing fluid communication between the chambers at the bottom of the vessel.

[c12] 15.The method of claim 11 wherein the vessel comprises low carbon steel and the solid iron source is an interior surface of the vessel.

- [c13] 16.The method of claim 11 wherein the liquid phase further comprises a surfactant.
- 17.The method of claim 11 wherein the liquid phase further comprises a strong base.
- [c14] 18.The method of claim 16 wherein the strong base is potassium hydroxide.
- [c15] 19.The method of claim 11 further comprising the step of condensing and removing condensable hydrocarbon vapours from the gas stream prior to entry of the gas stream into the vessel.
- 20.The method of claim 11 further comprising the step of re-circulating the liquid phase by distributing the liquid phase at or near the top of the vessel such that the liquid phase is sprayed onto the inner surface of the vessel and/or through the gaseous phase or both onto the inner surface of the vessel and through the gas phase.